

PROFILE

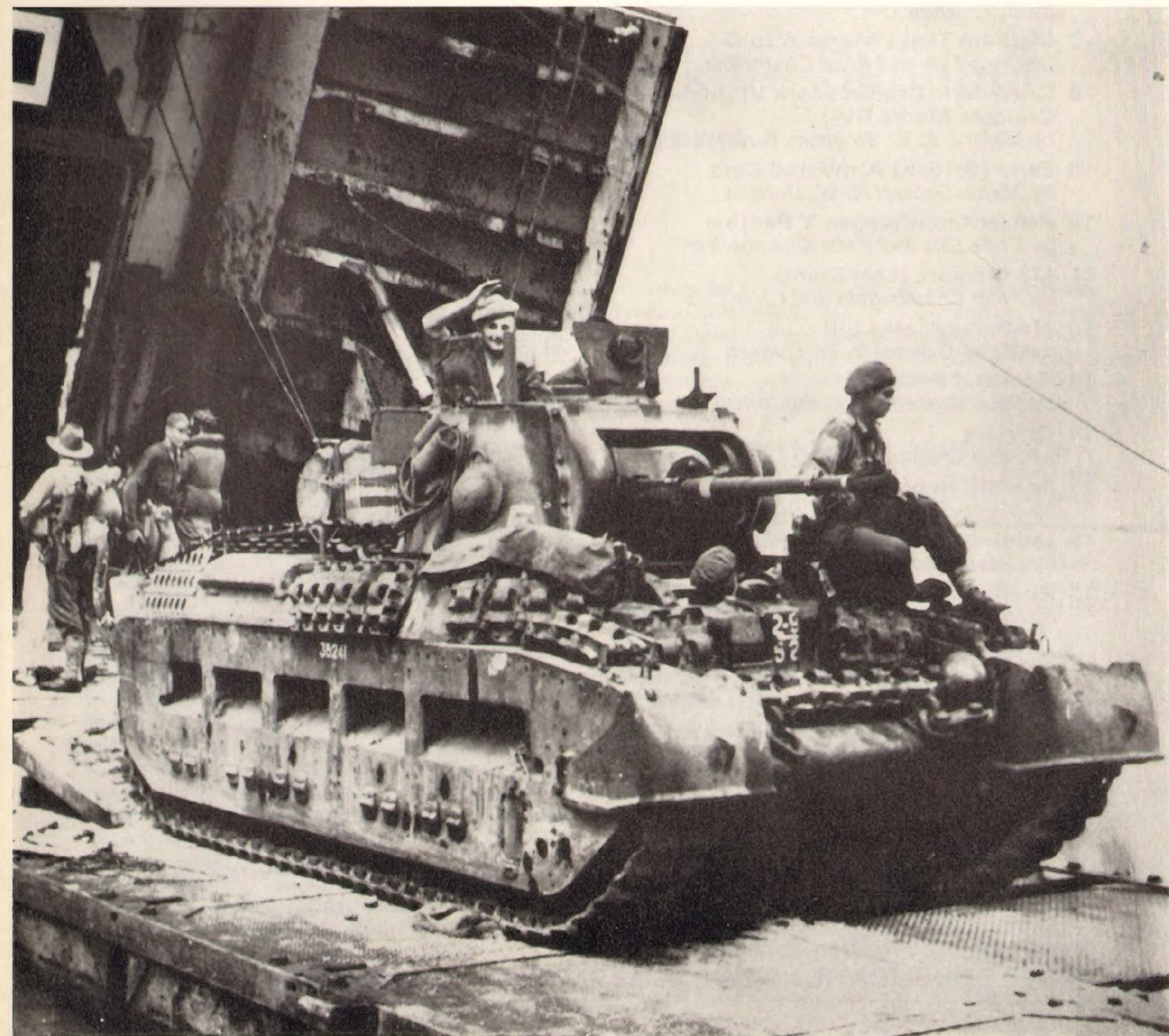
AFV WEAPONS

31

Australian Sentinel and Matildas

35p/\$1.50

by Major James Bingham



AFV/Weapons Profiles

Edited by DUNCAN CROW

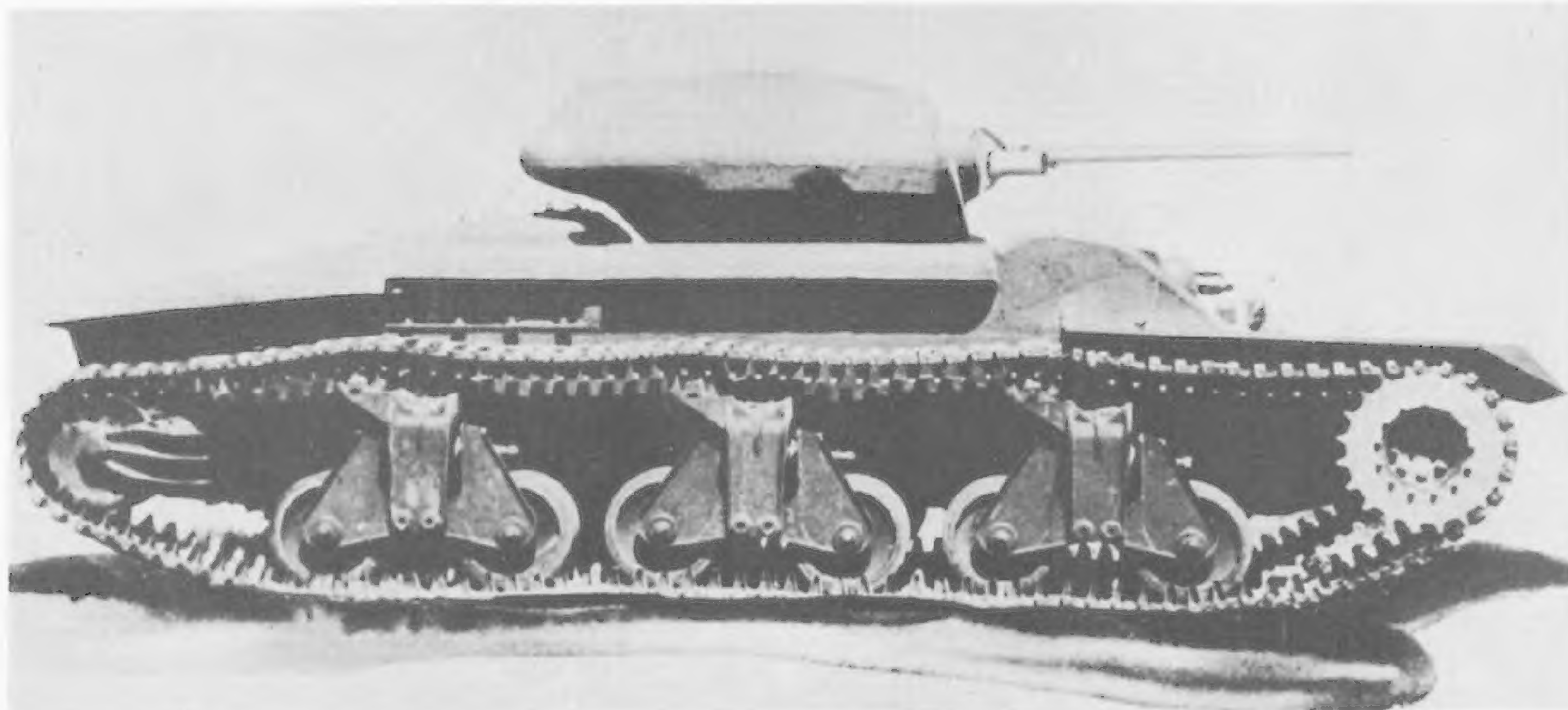
Check list of published titles:

- | | |
|--|---|
| 1 Churchill—British Infantry Tank Mk. IV
<i>by B. T. White</i> | 18 Chieftain and Leopard (Development)
<i>by Major Michael Norman</i> |
| 2 PanzerKampfwagen III
<i>by Walter Spielberger</i> | 19 Chieftain and Leopard (Description)
<i>by Major Michael Norman</i> |
| 3 Tanks Marks I to V
<i>by Chris Ellis and Peter Chamberlain</i> | 20 Churchill and Sherman Specials
<i>by Peter Chamberlain and Chris Ellis</i> |
| 4 Light Tanks M1-M5 (Stuart/Honey)
<i>by Chris Ellis and Peter Chamberlain</i> | 21 Armoured Cars—Guy, Daimler,
Humber, A.E.C.
<i>by B. T. White</i> |
| 5 Light Tanks Marks I-VI
<i>by Major-General N. W. Duncan</i> | 22 PanzerKampfwagen 38(t) and 35(t)
<i>by John Milsom</i> |
| 6 Valentine—Infantry Tank Mark III
<i>by B. T. White</i> | 23 Soviet Mediums T44, T54, T55 and T62
<i>by Major Michael Norman</i> |
| 7 Medium Tanks Marks A to D
<i>by Chris Ellis and Peter Chamberlain</i> | 24 The M48/M60 Series of Main Battle
Tanks
<i>by Colonel Robert J. Icks, USAR Retd.</i> |
| 8 Crusader—Cruiser Mark VI (includes
Cruisers Marks I-VI)
<i>by Major J. K. W. Bingham, Royal Tank Regt.</i> | 25 Cromwell and Comet
<i>by Major James Bingham</i> |
| 9 Early (British) Armoured Cars
<i>by Major-General N. W. Duncan</i> | 26 Hellcat, Long Tom, and Priest PLUS
Complete Check List of All U.S.
World War II SPs
<i>by Colonel Robert J. Icks</i> |
| 10 PanzerKampfwagen V Panther
<i>by Chris Ellis and Peter Chamberlain</i> | 27 Saladin Armoured Car
<i>by Major Michael Norman</i> |
| 11 M3 Medium (Lee/Grant)
<i>by Peter Chamberlain and Chris Ellis</i> | 28 S-Tank
<i>by R. M. Ogorkiewicz</i> |
| 12 Mediums Marks I-III
<i>by Major-General N. W. Duncan</i> | 29 M4 Medium (Sherman)
<i>by Peter Chamberlain and Chris Ellis</i> |
| 13 Ram and Sexton
<i>by Peter Chamberlain and Chris Ellis</i> | 30 Armoured Cars—Marmon-Herrington,
Alvis-Straussler, Light Reconnaissance
<i>by B. T. White</i> |
| 14 Carriers
<i>by Peter Chamberlain and Duncan Crow</i> | 31 Australian Cruiser—Sentinel;
and Australian Matildas
<i>by Major James Bingham</i> |
| 15 PanzerKampfwagen I and II
<i>by Major-General N. W. Duncan</i> | |
| 16 Landing Vehicles Tracked
<i>by Colonel Robert J. Icks, USAR Retd.</i> | |
| 17 Russian KV and IS
<i>by Major Michael Norman, Royal Tank Regt.</i> | |

Parts 1-17 price 25p each from your local book or model shop. Part 18 onwards price 35p each.
Retail prices in USA 1-17 \$1.25, 18 onwards \$1.50.

If you have any difficulty in obtaining Profiles from your local book or model shop please write direct to:

Mail Order/Subscription Department,
PROFILE PUBLICATIONS Ltd, Coburg House, Sheet Street, Windsor, Berks. SL4 1EB



Prototype of AC1. Note the steel track and trailing return rollers on top of suspension units.

(Photo: R.A.C. Tank Museum)

Australian Cruiser Mark 1—Sentinel

by Major James Bingham, Royal Tank Regiment

SOON after the outbreak of the Second World War in 1939 it was foreseen in Australia that most of her military equipment would have to be made at home, rather than continuing to rely upon British sources, and steps were taken to build light armoured vehicles from British designs.* The urgency of this programme was suddenly increased when the Allied forces collapsed against the German blitzkrieg in France in May 1940, and when the products of British factories were fully committed to building up their own forces against the threat of invasion. In this situation, and with the intention of equipping the Australian forces in the Middle East, the Department of Defence recommended in June that an attempt be made to manufacture cruiser tanks in Australia. With the approval of the War Cabinet, the project began, although hedged with doubts in some quarters.

The task of designing and producing a tank was a technically ambitious programme, since Australia had a comparatively limited engineering industry and had not even manufactured a motor car. Indeed, apart from some opposition within Australia, there was a disbelief abroad that their industry was capable of producing tanks. Nevertheless, the Army and Department of Munitions accepted the challenge with enthusiasm and soon established a close liaison between their two sections which were responsible, respectively, for design and production.

One of the first steps in gathering information and

resources for the project was to send an Ordnance Production engineer, Mr. A. Chamberlain, to the United States to study tank production there. Also, a request was made to Britain for the help of an expert in tank design, and Colonel W. D. Watson arrived in December 1940 to join the Army Design Directorate.

DEVELOPMENT AND PRODUCTION

In November 1940 the General Staff issued the specification of the tank required—one weighing between 16 and 20 tons, mounting a 2-pdr. gun with one or two machine-guns, a speed of 30 m.p.h. and an armour basis of 50 mm. It was, of course, desirable that the tank should conform to standard designs used in Britain or the United States, but, within the specification, the design had to take account of what components were already being or could be made in Australia, or which could be imported. Experience in France in 1940 had shown that there was no proven British tank in service which was a suitable model for an Australian tank. Nor was there a battle-trying American tank, but the medium tank M3 was selected as the one offering best scope in meeting the General Staff requirement.

Colonel Watson, on his way to Australia, visited the United States where, in company with Mr. Chamberlain, he studied the M3. He was impressed by the automotive features of this tank and when he got down to the basic design of the new Australian tank he aimed to retain many of the components of the M3. The design which eventually emerged, as the Australian Cruiser Tank Mark 1 (AC 1), was a

*See Volume Two, page 120.



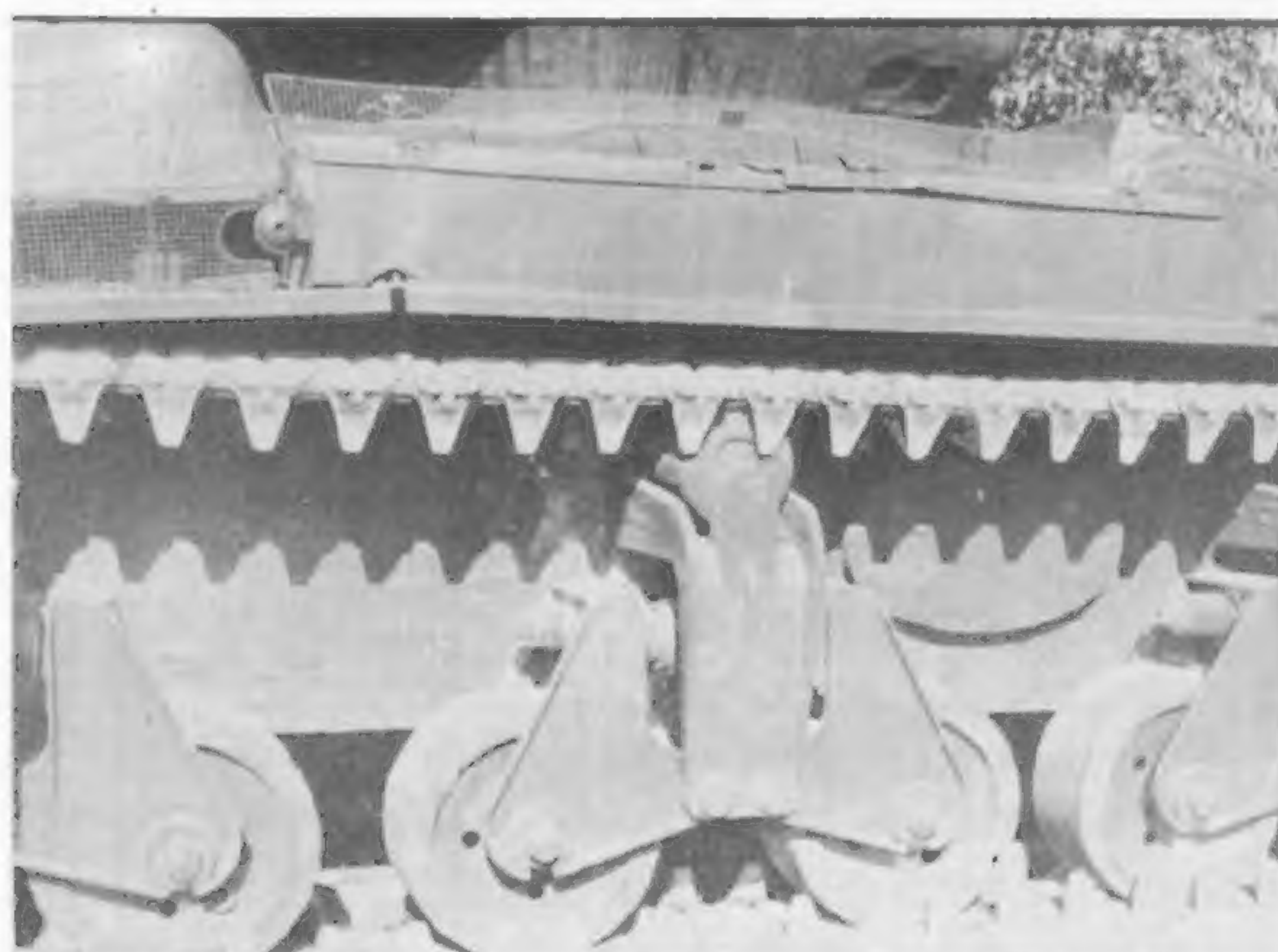
The Sentinel in camouflage paint, mounting a bin on the back of the turret and a jettison tank. (Photo: R.A.A.C. A.F.V. Museum)

blend of American automotive practice with British ideas on armour with a low silhouette.

There were, however, considerable difficulties ahead for manufacture within the capacity of Australian industry and there was little tangible progress in the early part of 1941. Early designs showed the hull as being formed by a combination of cast and rolled armour plates, but firms which could produce heavy rolled plates were already fully committed. After considering plans for the hull to be made up in cast sections, proposals were made for the hull to be cast as one solid unit—a method never attempted anywhere before in so large a tank. Despite criticisms from experts, experiments started in mid-1941 to perfect the method of casting and to find a formula for suitable armour using alloys indigenous to the country.

The suspension unit adapted for the Sentinel. Note the escape hatch in the hull side of AC1; this hatch was moved in AC3 to a position behind the driver's head.

(Photo: R.A.A.C. A.F.V. Museum)



The type of power unit required had been under investigation since July 1940 and it was expected that this would have to be imported. Despite the heavy commitments on American industry, there had been hopes of obtaining the Guiberson diesel; later, however, when the armour thickness was increased to 65 mm. and the design weight went up to 25 tons, Cadillac motor car engines were chosen to form a single power unit made up with three engines. This revolutionary arrangement provoked keen controversy, even from the parent firm of General Motors in America, but by April 1941 tentative agreement had been reached.

The design of the Medium M3 gearbox and final drive, which was to be incorporated in the AC 1, presented a more intractable problem as the machine tools needed to cut the intricate gears in these units

Two 25-pdr. guns mounted on an AC1 test vehicle. When fired simultaneously, the twin 25-pdrs. gave a recoil approximately 20% greater than that of the high-velocity 17-pdr.

(Photo: R.A.C. Tank Museum)





The 17-pdr. and turret mounted on an AC1 test vehicle.

(Photo: R.A.C. Tank Museum)

did not exist in Australia; nor was there any prospect of obtaining the tools from Britain or America for at least a year.

In this situation of apparent impasse, Mr. Chamberlain returned from the U.S.A. in May 1941 with proposals for a second Mark of tank, to be known as the AC 2, which would be lighter and simpler, and would use imported power and transmission units produced commercially for heavy trucks in the U.S.A., thereby eliminating the delays inherent in setting up Australian production. In June the Army reluctantly accepted the AC 2 project on the understanding that delivery would start at the end of the year. But the feasibility of the project depended on the weight being kept down to 16-18 tons, within the capacity of the transmission units. Nothing had been settled.

There was continued divergence of opinion, and in July the Government set up a new Directorate of Armoured Fighting Vehicles Production that would take over within one agency the problems of design and production, within the Ministry of Munitions. Mr. A. R. Code, who was an automotive engineer with considerable experience in the industry, became the Director, and he was joined by Colonel Watson for the design work. A re-examination was made of the position on tank production and the AC 2 project was found to be less practical than at first believed. The design weight had emerged at about 22 tons, which could not be reduced without sacrificing armour; and the forecast dates for delivery of the imported components, upon which all depended, seemed to be ever receding while the danger of Japanese intervention in the Pacific was becoming more threatening. In

September, 1941 the Minister for the Army issued instructions that work on the AC 2 should stop, and that the AC 1 be taken in hand as first priority.

In the meantime, design work on the AC 1 had progressed. Drawings had been made of a modified M3 gearbox and final drive which eliminated the syncro-mesh gears and other manufacturing complexities, and it was found possible to make the units

A troop of Sentinels deployed for training.

(Photo: R.A.C. Tank Museum)





The AC1 mounting 2-pdr. gun, with water-cooled Vickers machine-guns in co-axial and front hull mountings.

(Photo: R.A.C. Tank Museum)



The AC3 mounting 25-pdr. and co-axial Vickers machine-gun. Note the difference from the AC1 in the new, sharply sloping hull front and the changed aspect of the hull top.

(Photo: R.A.A.C. A.F.V. Museum)

completely in Australia. Also, in October the casting of the first hull as a single unit was successfully completed. The major obstacles were now overcome for production of the tank entirely in Australia, except for the Cadillac engines and a few small items, and planning went rapidly ahead on a firm overall design. In January, 1942 the first of three AC 1 pilot models was completed, and the first production model was delivered in August—only eleven months after a firm order had been given to go ahead, and 22 months since the idea had taken shape as a General Staff specification.

Despite the comparative speed with which the AC 1 had been produced, experience abroad had shown the need for major improvements and it was decided to

Rear view of AC3. The power unit cover plate on AC1 was similar, giving access to engines, radiators and fuel tanks through hatches.

(Photo: R.A.A.C. A.F.V. Museum)



limit production of AC 1 to 66. Weaknesses included the quick wearing out of the bogie wheel tyres, a weak turret drive gear when the tank was on a slope, and an unsatisfactory engine cooling system, but the main shortcoming was the poor firepower provided by the 2-pdr. gun. Allowance had been made in the design for the 6-pdr. gun to be mounted when available, but, with the urgent demand for anti-tank guns in the Middle East in 1942, none was allotted for the AC 1 project. In order to give the tank a heavier "punch", a pilot model AC 1 was taken for testing with the Australian produced 25-pdr. gun. On 29 June, 1942 the tank was successfully test-fired at Williamstown, Victoria, and work started on the prototype of what was to be called the AC 3, mounting the 25-pdr. gun and incorporating other improvements. A fully equipped model was tested at Wakefield, South Australia, in February, 1943, and it was decided in April to mount the 25-pdr. on a production basis in the AC 3 when the order for the AC 1 was completed.

The next stage in development was to mount the high-velocity 17-pdr. gun, also being manufactured in Australia, in a fourth and heavier Mark known as AC 4. This did not go beyond the stage of design and testing of new components but it was sufficiently far advanced for the Army to state in March, 1943 a requirement for some 700 AC 3 and AC 4, including a second version of the AC 4 mounting the 25-pdr.

The production programme so far had centred upon



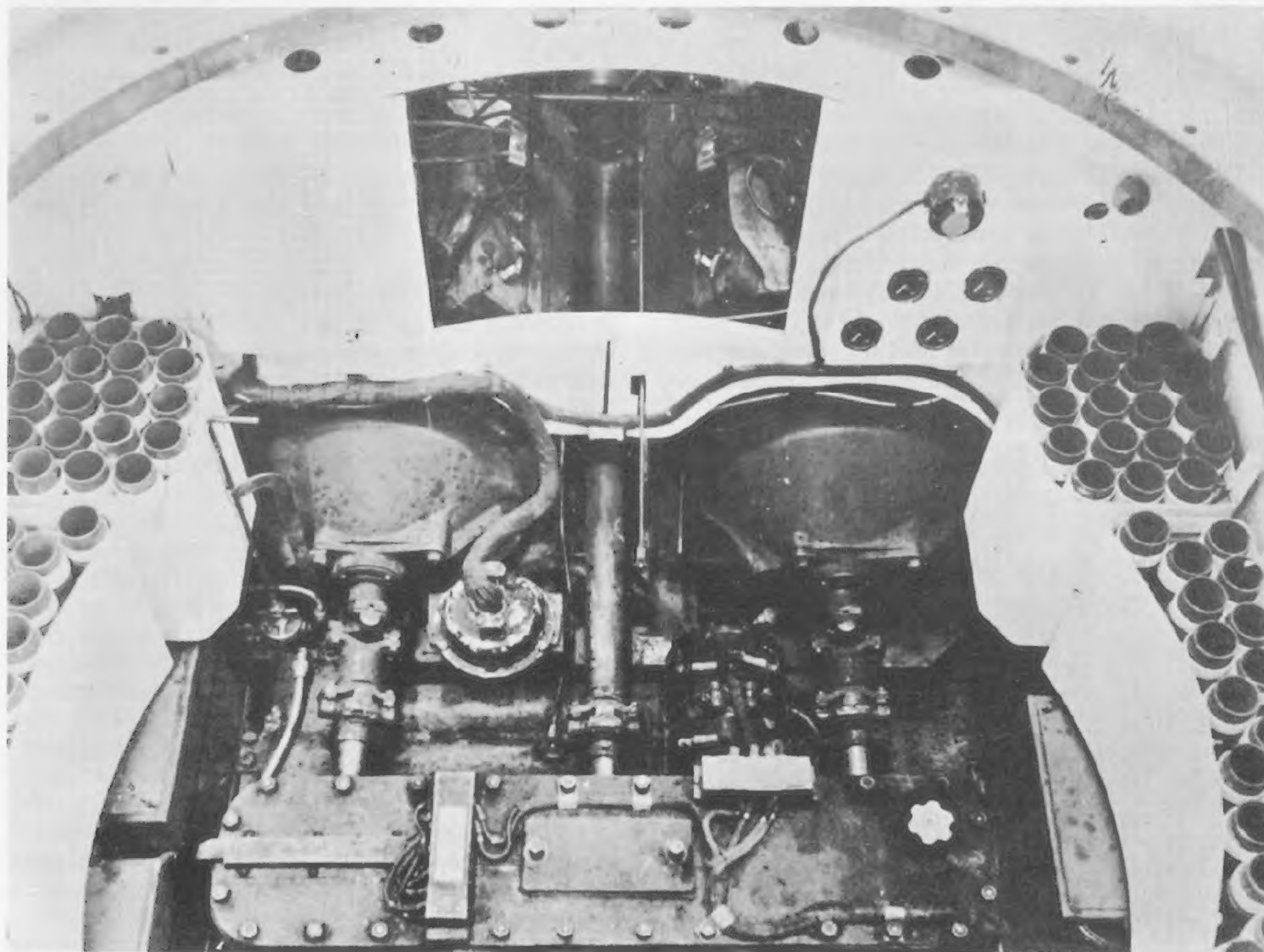
The AC3. The co-axial Vickers machine-gun was retained within an armoured shield beside the 25-pdr.

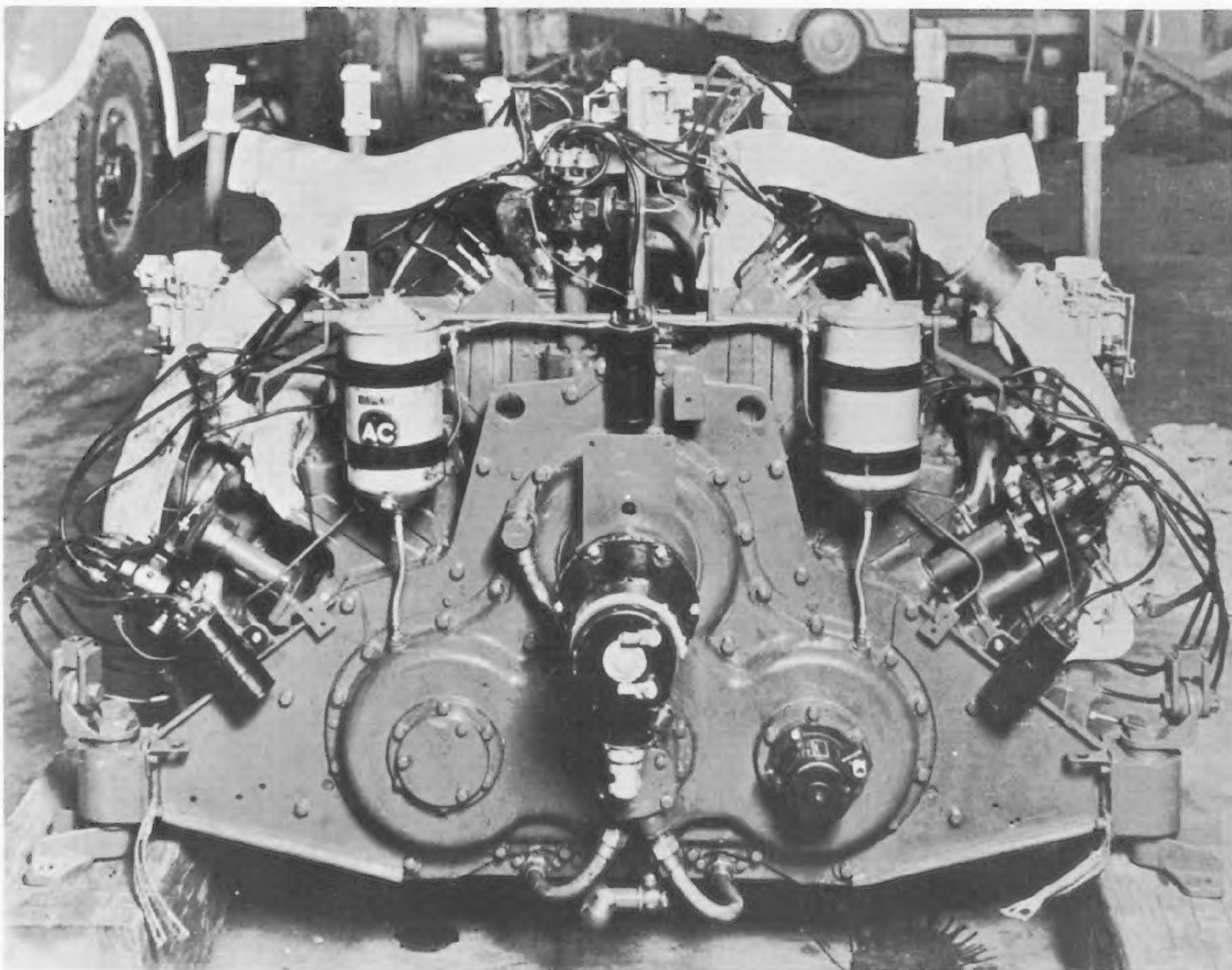
(Photo: R.A.A.C. A.F.V. Museum)

New South Wales where the Government Railways acted as the major co-ordinating contractors and operated a specially built assembly plant at Chullora which had been completed in July, 1942. Plans were in hand to double the production programme by the end of 1943, by opening additional foundries and another assembly plant in Victoria, but these were not taken into use for the purpose.

Driving shafts from each of the three engines in AC1 led forward to the transfer box beneath the turret turntable.

(Photo: R.A.A.C. A.F.V. Museum)

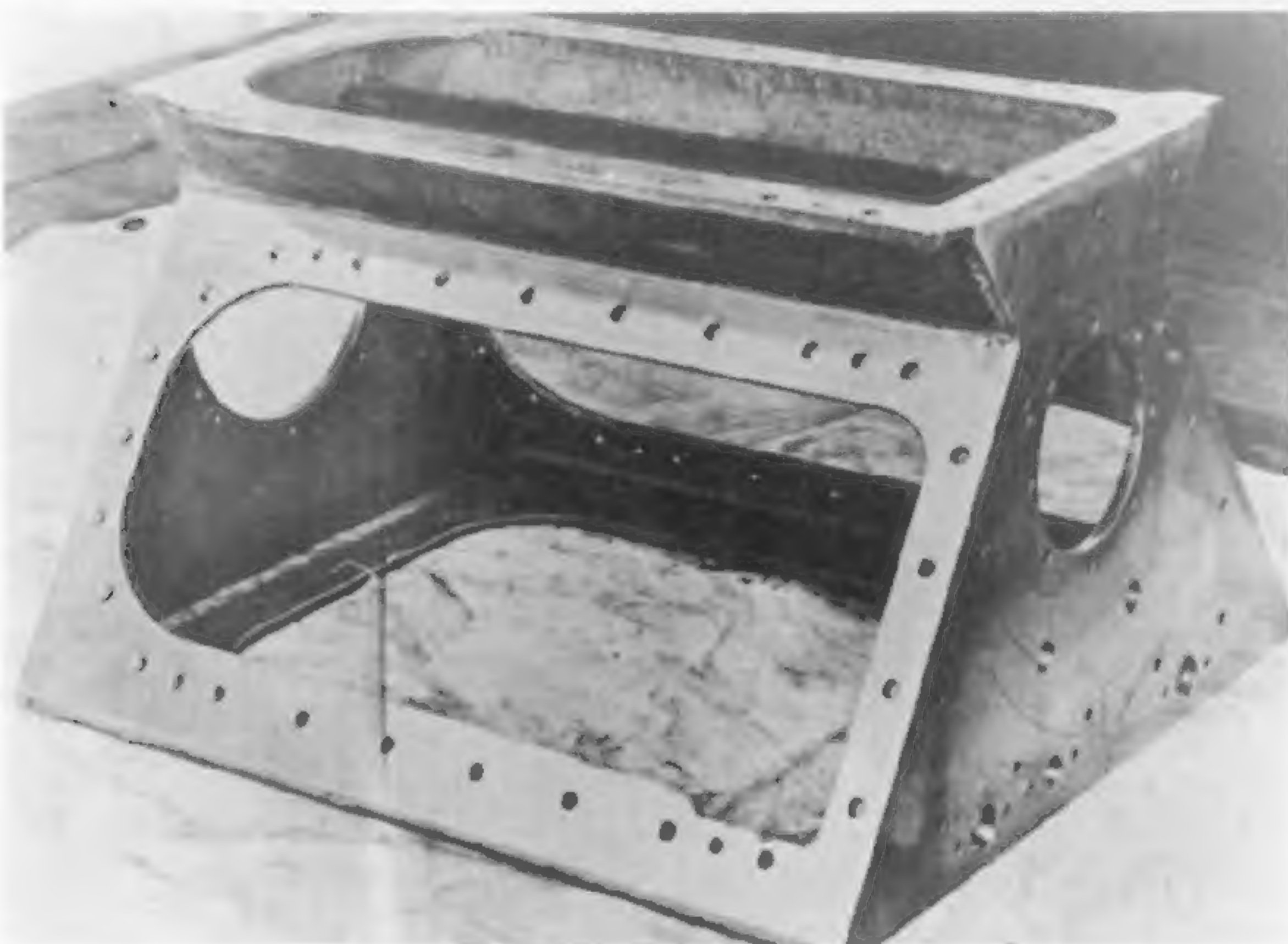




The Perrier-Cadillac 41-75 arrangement of three engines mounted radially on a steel frame around a common crankcase—AC3 and AC4.
(Photo: R.A.A.C. A.F.V. Museum)

American observers were impressed by the AC 3, and General MacArthur commented favourably upon the Australian tank production programme, but Lease-Lend authorities in the U.S.A. could not encourage this diversion of labour and materials. They held that more in the war effort could be achieved in Australia with work on maintaining the American

The triangular case on which the three Cadillac engines were mounted radially to form the Perrier-Cadillac power unit for the AC3 and AC4.
(Photo: R.A.A.C. A.F.V. Museum)

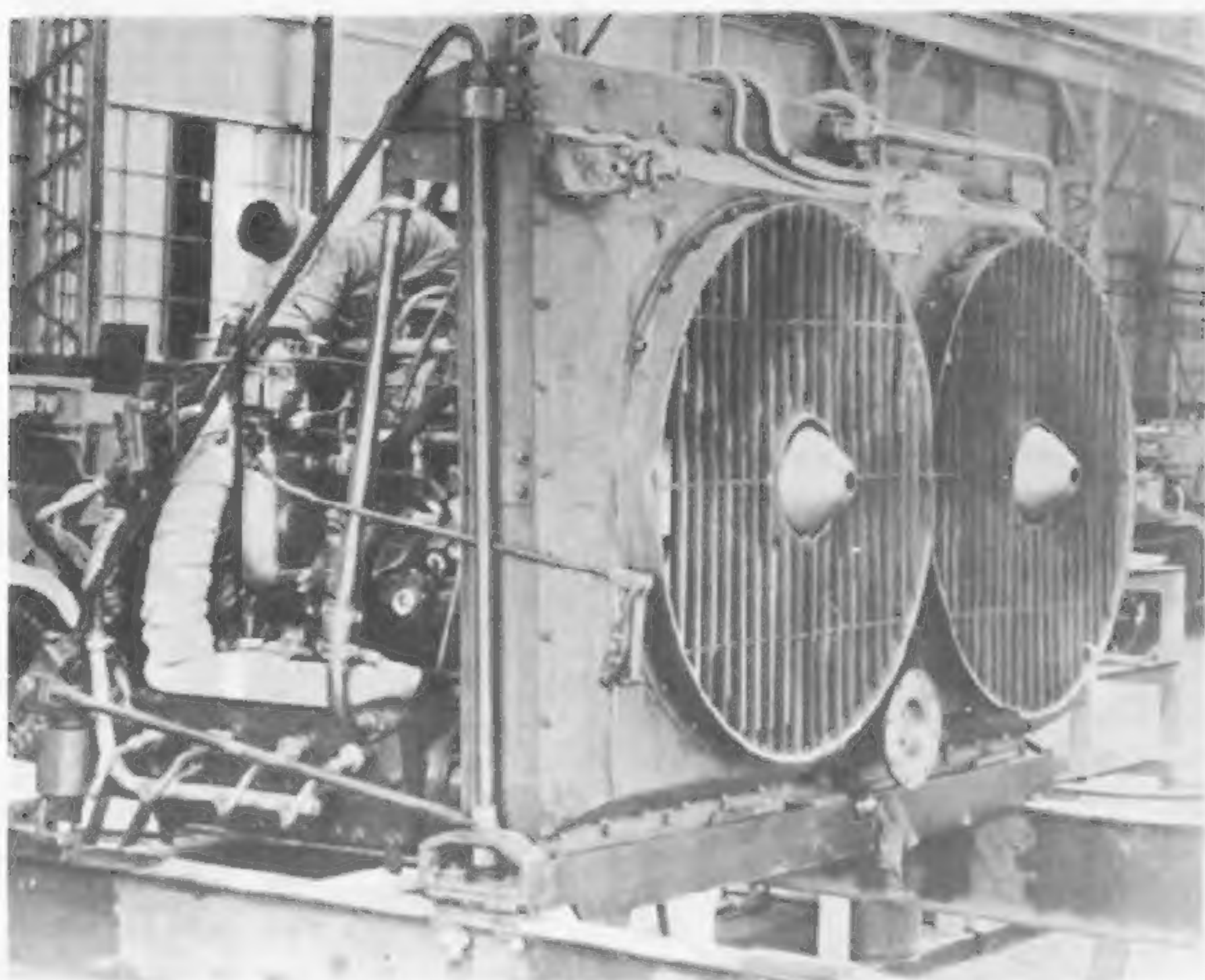


tanks which had already arrived in 1942 to equip the Australian forces; also, that the factories should build more railway engines and wagons to sustain the increasing use of the railway system for war work. By 1943 the threat of Japanese invasion on the mainland of Australia had passed and, with General Grant and Matilda tanks being made available from the Middle East also, there was no longer the same need for a home-produced tank. In July the Government ordered production of the Australian Cruiser tank to cease. At that time the initial order for the AC 1 was on the point of completion, and pilot models of AC 3 were being assembled. Those which had been produced were taken into use for training, under the name of Sentinel.

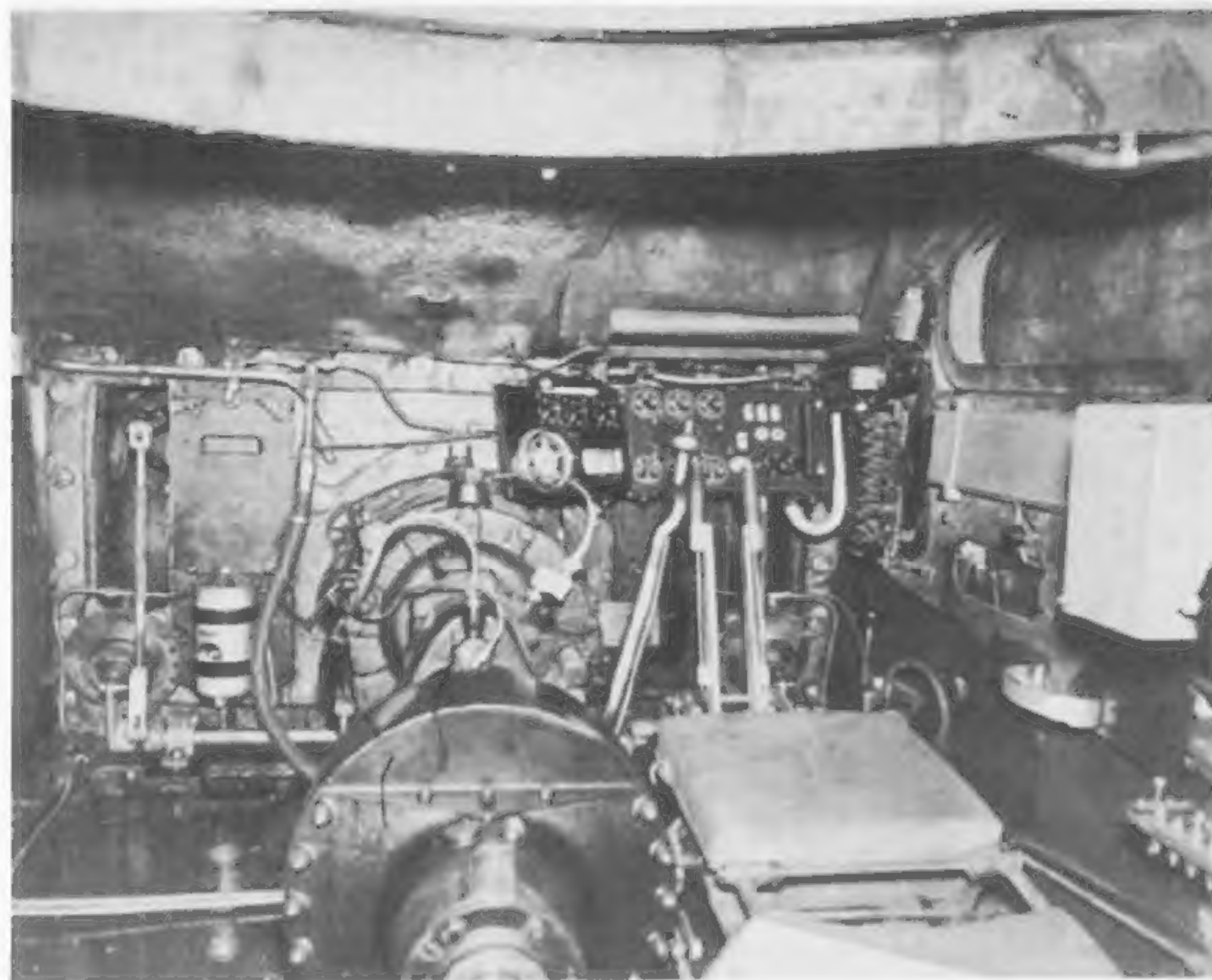
DESCRIPTION OF THE SENTINEL

There were four main castings of armour plate which made up the tank—the main body, to which was bolted the nose section, the power unit cover plate, and the turret.

In the front compartment, on the right side, was the driver, who was separated from the hull gunner's position by the gearbox and the ball-mounted, water-cooled Vickers .303 machine-gun. In the middle compartment was the turret, supported on the main body and carrying the turntable which held a crew of three



The fans and radiators were mounted at the front of the Perrier-Cadillac power unit. (Photo: R.A.A.C. A.F.V. Museum)



The front compartment and driver's controls in the partially completed hull of an AC3. (Photo: R.A.A.C. A.F.V. Museum)

—commander, loader/wireless operator and gunner. The commander sat on the left, behind the gunner, and he had a flat, revolving cupola which held two periscopes. The loader/operator on the right attended to both guns and to the wireless set in the bulge at the rear of the turret.

The power unit cover plate completely covered the rear compartment, containing the power unit which consisted of three Cadillac 75 engines, fuel tanks, radiators and fan assembly mounted on a subframe. The three engines were arranged in "clover leaf pattern" with two engines side-by-side and one centrally behind, each transmitting power to the transfer box mounted transversely across the floor of the main body, beneath the turret. The combined power of the three engines was transmitted by a single shaft from the transfer box forwards to the main clutch and gearbox. Drive to the sprockets passed through the front axle assembly and the final drive housed in the nose casting; the brakes were operated by the steering levers and were integral with the differential.

The electrical system was complex. A 6-volt system operated the lights, ignition and starter motors, for which the normal engine generators charged three separate batteries; the batteries were connected by switches so that the load could be transferred to any battery as required. A 12-volt system was charged by a separate generator driven off the transfer box, through two additional 6-volt batteries which powered the wireless and inter-communication sets, the two machine-gun cooling motors and the electrically operated Graviner fire extinguisher system. Finally, the turret traverse mechanism was driven by a 40-volt system charged directly by a generator off the transfer box; the starting of any engine immediately provided power, through the transfer box and the 40-volt generator, for the turret traverse motor.

The suspension was based on that of the M3 medium tank. However, due to unfavourable reports on the M3 design, the Hotchkiss type suspension was adopted with horizontal volute springs. The standard M3 rubber track was accepted initially as a temporary

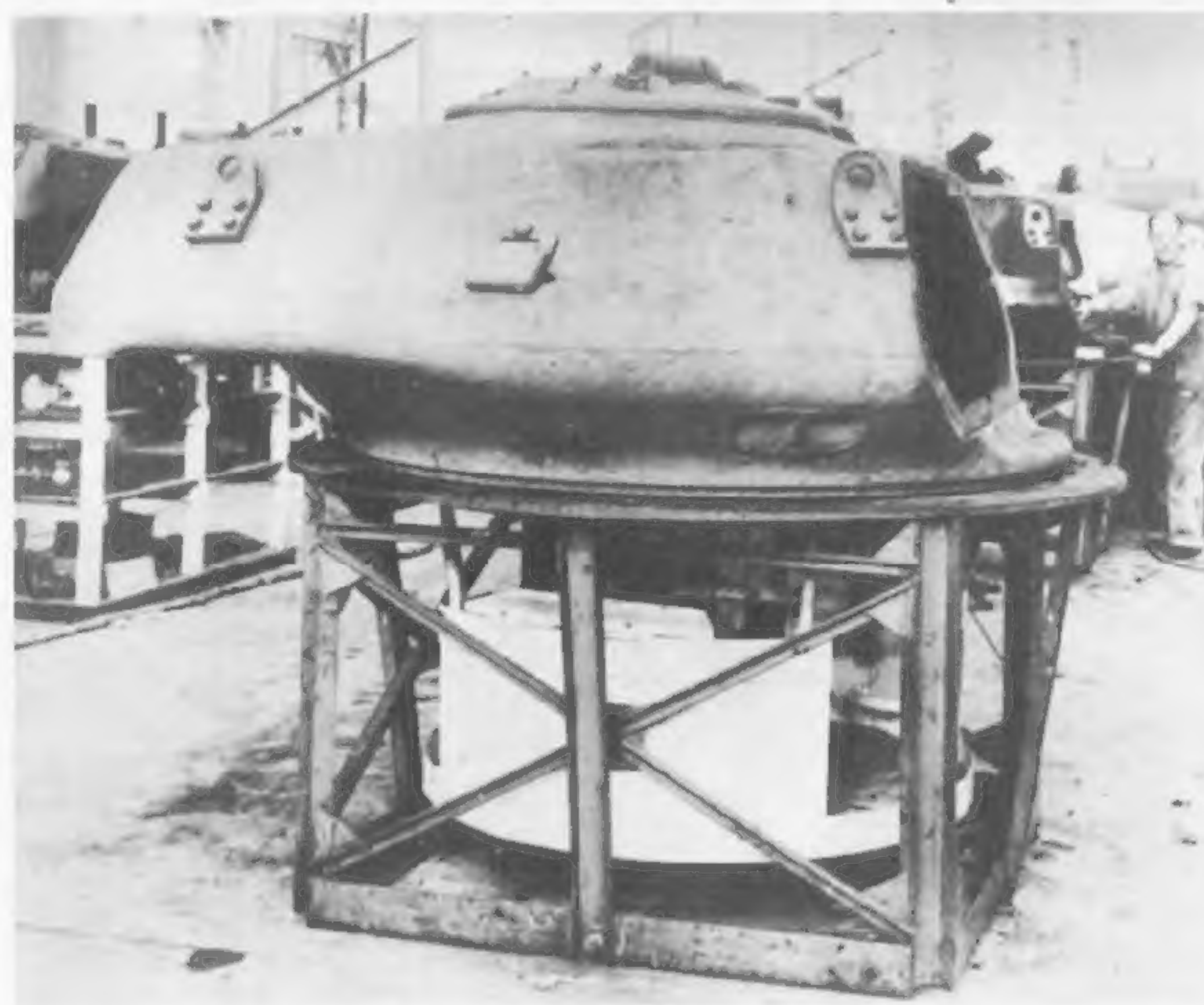
expedient (and most photographs show this type of track in use) but an Australian all-steel track was also made and fitted.

AUSTRALIAN CRUISER MARK 3

Production of the AC 3 in quantity was not achieved, although a number of hulls had been made when work on the tank was cancelled in July, 1943. The main and obvious difference from the AC 1 was the 25-pdr. gun, mounted in a similar but larger turret carried on a turret ring which had been increased in diameter from 54 to 64 inches; the hull angles were modified to accept this change. The Vickers .303 machine-gun was retained as co-axial armament with the 25-pdr., but the hull gun was removed and the front armour was sloped back sharply. The space vacated by the front gunner was used for ammunition stowage.

Internally, an improved engine lay-out offering greater power in less space was achieved with the three Cadillac engines arranged radially on a steel frame around a common crankcase, transmitting power to a

In the turret section of the assembly plant at Chullora, operated by the New South Wales Government Railways. (Photo: R.A.A.C. A.F.V. Museum)





An AC3 hull in the assembly plant. When Bradford Kendall Ltd., of Sydney, developed the techniques in 1941 of casting the AC1 hull as a single piece, this method of tank manufacture had not previously been used in so large and complex a unit.
(Photo: R.A.A.C. A.F.V. Museum)

transfer case which was incorporated in that unit. Credit for much of this work must go to Mr. R. Perrier, a French tank designer whose name is linked with this engine lay-out; he had been in Japan in 1940, on loan from the French government, and had made his way during the war to Australia.

AUSTRALIAN CRUISER MARK 4

The AC 4, as planned, was essentially a modified version of the AC 3, mounting the 17-pdr. gun and with an increased weight at 31 tons.

In order to test the Australian cruiser's ability to withstand the recoil of the high velocity 17-pdr. gun, tests were carried out in March 1943 with two 25-pdrs. mounted together in a special turret. The tank stood up to these tests in which the twin 25-pdrs., fired simultaneously, gave a recoil approximately 20% greater than that of the 17-pdr. and subsequent firing tests with the 17-pdr. in a turret were satisfactory. The new turret ring had a diameter increased yet again to 70 inches, and the Vickers machine-gun was retained in the co-axial mounting.

Although designs specified the Perrier-Cadillac power unit of the AC 3, another and more powerful unit was tested, consisting of four Gipsy Major engines built in Australia by General Motors—Holdens.

COMMENTARY

In any history of armour the Australian Cruiser tank, or Sentinel, is easily overlooked, or even dismissed, as having no influence on the development of other vehicles. That may be true, for it was unique in its own development and the project was killed before any significant number had been produced. Nevertheless, it is an interesting tank and its very existence was a remarkable achievement for a limited engineering industry, owing much to the determination, ingenuity and improvisations of the designers and manufacturers

Front view of AC1, Sentinel.

(Photo: R.A.A.C. A.F.V. Museum)





Side view of AC1, Sentinel. (Photo: R.A.A.C. A.F.V. Museum)

who were forced by circumstances to find and adopt some novel features.

In its cast hull, for a tank of this size, the Sentinel preceded the American M48 by about 10 years, and this work on development of cast armour was acknowledged at the time as a "real contribution". The development of AC 4 with the 17-pdr. gun was contemporary with similar work in Britain for this new weapon in a tank mounting and, whereas Sentinel was shown to be capable of accepting the 17-pdr., British designers had to go to new hulls (Challenger, Avenger) and, later, the Sherman.

As the Sentinel never went into action it is pure conjecture as to whether it would have been a reliable and battleworthy tank. There are justifiable criticisms on that score. Certainly, the AC 1 was obsolescent in terms of firepower before it was produced—a weakness shared with other tanks of the period. Mechanically, the Sentinel gave the performance required and it stood up to the rigours of training. It was not until 1956 that the tank was declared obsolete for this purpose.

SPECIFICATION—AUSTRALIAN CRUISER MARK 1, SENTINEL

General

Crew: 5—Commander, gunner, loader/operator, driver, hull gunner. (AC 3 crew—4).
Weight, laden: 28 tons.
Power/weight ratio: 12 to 1 b.h.p./ton.
Ground pressure: 13.4 lbs./sq. in.

Dimensions

Length overall: 20 ft. 9 ins.
Height overall: 8 ft. 4½ ins.
Width overall: 9 ft. 1 in.
Track centres: 7 ft. 6½ ins.
Track width: 16½ ins.

Armament

Main: QF 2-pdr. (AC 3—25-pdr.).
Auxiliary: Two Vickers .303 machine-guns, water-cooled, one co-axially mounted and one in forward hull mounting (AC 3—one co-axial Vickers). Bren .303 light machine-gun.



Note the wire screen which extends all the way behind the tool box on the track guard of the Sentinel. Behind the tool box (on both sides of the tank) air is vented or drawn in beneath an armoured cowl. The wire prevents litter getting packed behind the tool box. Side lights were fitted inside the metal protective loops on the hull sides above the track guards.

(Photo: R.A.A.C. A.F.V. Museum)

Fire control

2-pdr. and Vickers: shoulder controlled in free elevation.
Traverse by hand or electric motor powered directly by 40 volt generator (110 volt in AC 3). Rate of traverse 18°/second.

Ammunition

2-pdr.: 130.
Vickers: 4,250.

Sighting and Vision

Commander: Two periscopes in revolving cupola. Porthole in turret side.
Gunner: 2-pdr. Telescope type 24 B, and porthole.
Loader: Porthole
Driver and Hull Gunner (each): Revolving periscope, armoured visor in front and porthole at side.

Communications

Wireless Set No. 19 Mk. 2. Intercommunication between all crew by wireless set circuits.

Armour

Hull: One-piece casting to which the cast nose and power unit cover plate are bolted.
Armour basis 65 mm. Front: 45 mm. Sides and Rear: 25 mm. Top.
Turret: One piece casting, 65 mm. all round and 25 mm. Top.

Engine

Three Cadillac "75" engines arranged in "clover-leaf" pattern, transmitting power through clutch drives to transfer box and main clutch. 90° V-8 cylinder engines, water-cooled. Combined power 330 b.h.p. at 3,050 r.p.m. Fuel—140 gallons, plus 44 gallon jettison tank. (AC 3—Three Perrier-Cadillac 41-75 engines radially mounted.)

Transmission

Main clutch: Multi-plate dry.,
Gearbox: Constant mesh "crash" type. Five forward gears, one reverse
Steering: Controlled differential with epicyclic gear train in front axle assembly.
Brakes: External contracting, operated by steering levers and assisted by compressed air.

Suspension

Australian Hotchkiss type, with horizontal volute springs. Three sets of bogies on each side, each of two wheels and a return roller on top.
Rubber tracks: 86 links each side, 6 in. pitch.
Steel tracks: 129 links each side, 4 in. pitch.

Electrical System

6 volt system, with three 6 volt batteries charged by engine generators, for lights, starting, ignition.
12 volt system, with two 6 volt batteries charged by separate generator, for MG cooling water pumps, wireless, fire extinguisher equipment.
40 volt system, charged directly by separate generator, for turret traverse. (AC 3—110 volt.)

Performance

Maximum speed: 30 m.p.h.
Trench spanned: 8 ft.
Road range: 200 miles.

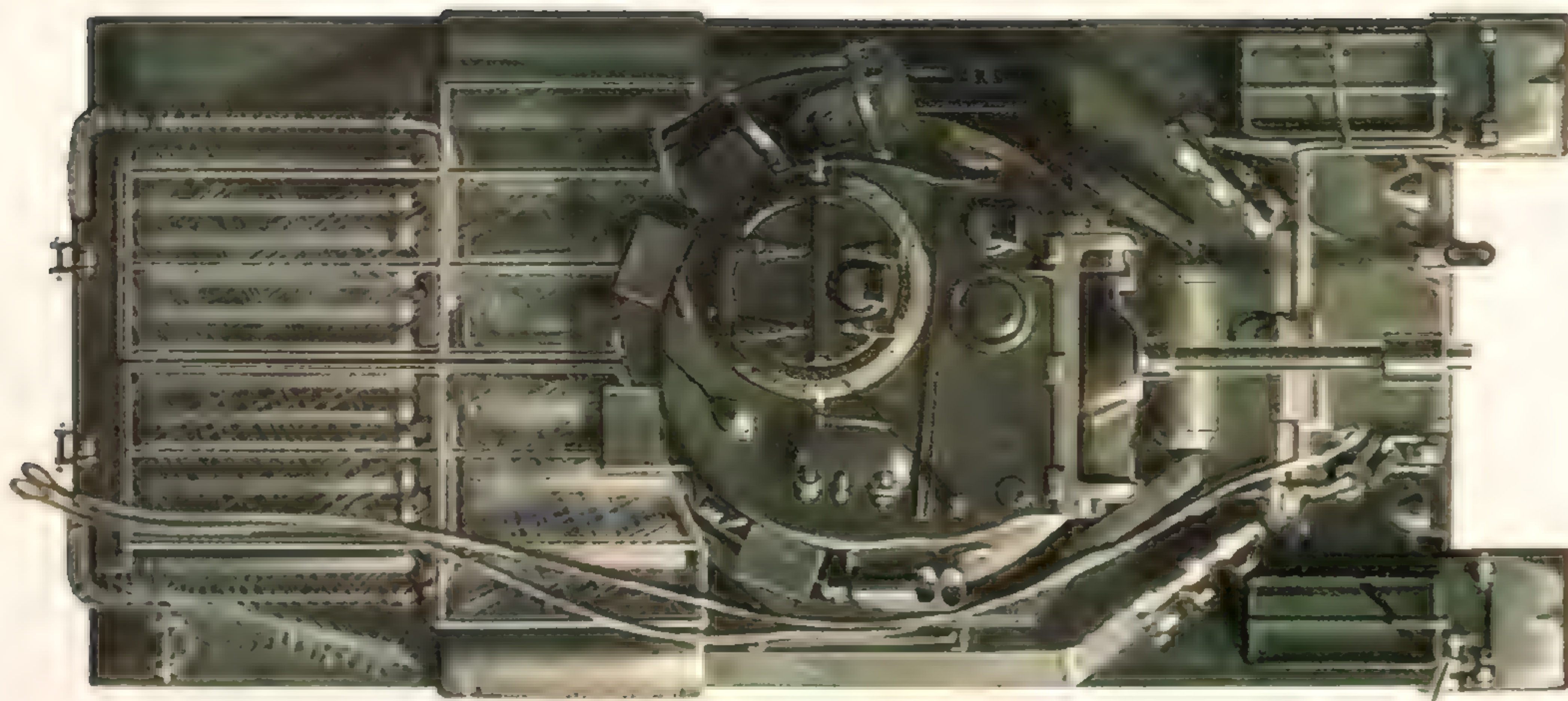


The Australian Cruiser was a unique development, which was a blend of British ideas on armour shape with American automotive practice, but it was Australian in concept and manufacture, relying very little on imported assemblies. The Australian Cruiser Mark 1, Sentinel, mounted a 2-pdr. gun and was taken into use for training after the whole project was stopped in 1943, when American tanks became available in large numbers. At that time trials and designs were far advanced towards production of two further Marks mounting a 25-pdr. or a 17-pdr. gun. This tank bears the camouflage colours matched to suit conditions in Australia.



M. Trim © Profile Publications Ltd.



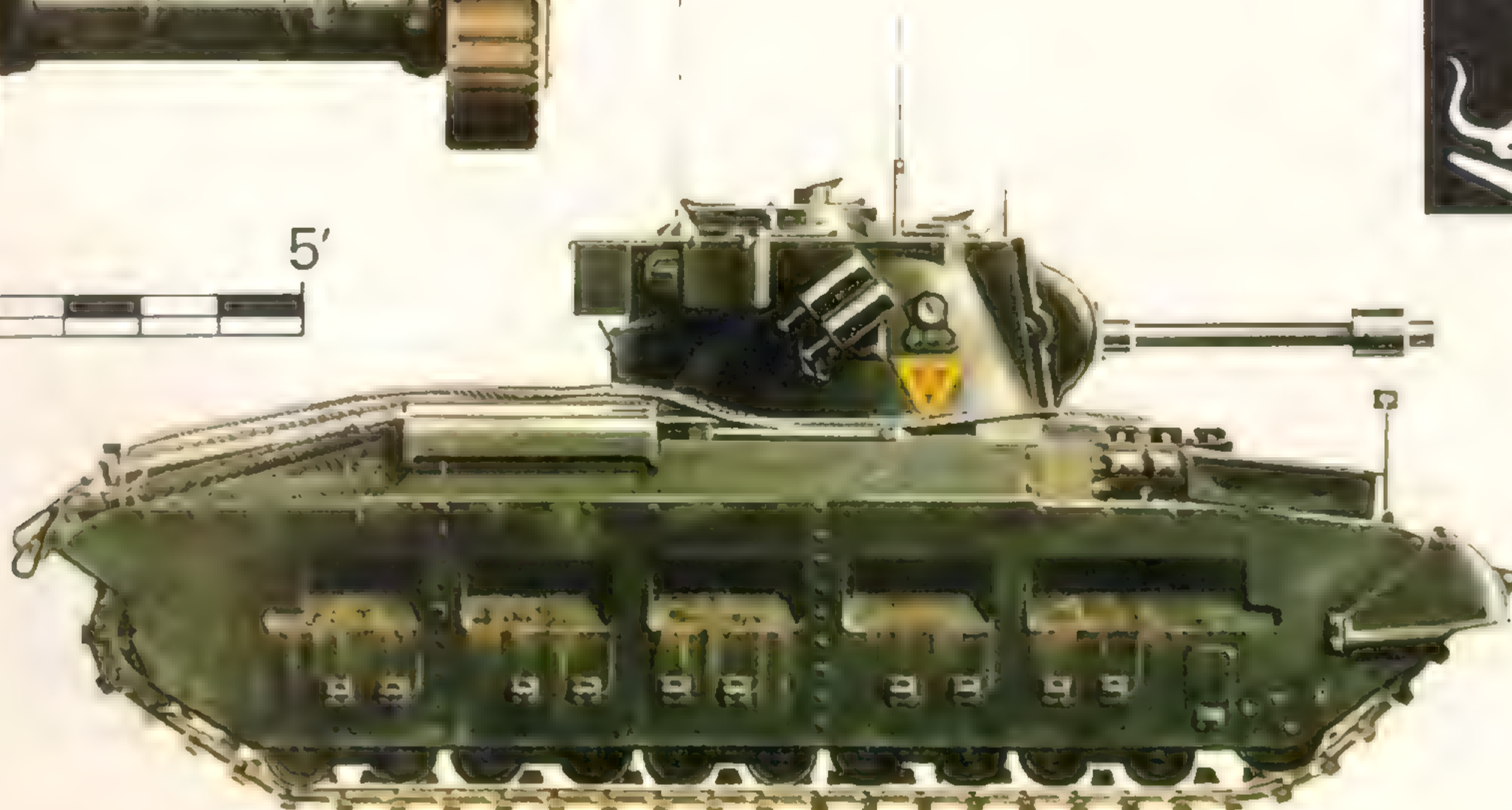
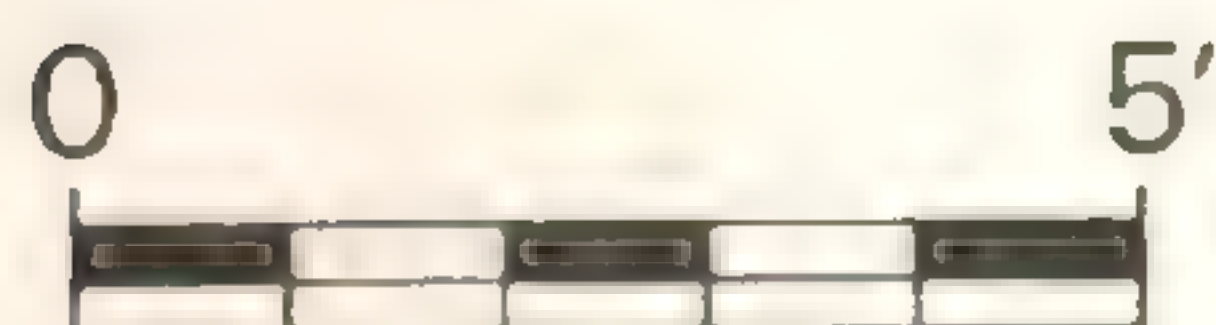


The Australian Matilda Frog was a standard Matilda 4 modified to carry flamethrowing equipment in the turret. It went into action against the Japanese in the assault landings on Borneo in July 1945, operated by the 2/1st Armoured Brigade Reconnaissance Squadron. This tank bears the unit markings and the sign of 4 Australian Armoured Brigade, which was formed specifically for operations in tropical areas. It is painted the dark green that was best for jungle warfare.

Local modifications, which could be of varied design, were fitted to most Matildas for this fighting at close quarters, and two of these are shown; an armoured shield on the hull top to protect the turret ring, and anti-magnetic mine screens over the engine louvres.



T. Hadler © Profile Publications Ltd.





Landing near Finschhafen, November 1943, before the first battle with Matilda tanks. Shipping was at a premium, and movement up the coast by landing craft was liable to be slow and laborious.
(Photo: Australian War Memorial)

Australian Matildas

by Major James Bingham

SOON after the Japanese entered the War, in December 1941, Australian forces were deployed for the defence of the mainland and the territories in New Guinea. Armoured units were equipped during 1942 mainly with the American M3 Medium and M3 Light tanks, but some Matildas were also issued. (The Australian Cruiser Mark 1 was in production in small numbers, but that project was to be dropped in the following year.)

The M3 Lights (General Stuarts) went into action in December 1942 in New Guinea during operations on the Buna Track and, despite the lack of proper training for infantry/tank co-operation, the tanks showed that they could effectively be used in "rooting the Jap out of his foxholes and rabbit warrens". As a result, the 4th Armoured Brigade was raised in 1943 on a scale suitable for operations in tropical areas, and one of its units was equipped with Matildas (as an Army Tank Battalion). The brigade was the parent formation for armoured units going to New Guinea and, in preparing for the jungle fighting ahead, the Matilda was selected as the most suitable tank available for the task. It was a rôle for which the tank had originally been designed, as a heavily armoured Infantry Tank, although the conditions would be

vastly different from those in which the tank had already proved itself in France and the Middle East.

In the close conditions on the islands of the South-West Pacific there would never be opportunities for armoured manoeuvre and the battalion/regiments of 4th Armoured Brigade were organised as self-supporting groups with their own detachments of engineers, signals, army service corps, workshops, ordnance field park and ambulance. In practice, when committed to operations, the regiments were normally split into separate, self-supporting squadron groups, sometimes hundreds of miles apart, with inadequate transport for stores and at the end of an intermittent supply line by landing craft and jungle track.

JUNGLE FIGHTING

In battle the squadron advance would, more often than not, be along a single track where the Troop Commander (3-in. Howitzer) took the lead, followed by the second tank (2-pdr.) and the leading infantry platoon, and then the third tank (2-pdr.). The closest co-operation was essential between infantry and tanks, whose crews were blinded by the jungle growth, and tank fire was normally controlled by an officer of the squadron who moved on foot with the leading



Side view of Matilda Frog, the tank-mounted flamethrower developed by the Australians specifically for operations in the South-West Pacific area. (Photo: R.A.A.C. A.F.V. Museum)

infantry, using a Walkie Talkie set. Tank fire was brought to bear on any opposition in range, and bunkers were engaged and destroyed at ranges of 10-30 yards. The 2-pdrs., as well as the 3-in. Howitzers, fired High Explosive shell. The first Matilda action on November 17, 1943 was to become typical.

"The first tank was unable to see (the machine-gun post) because of the upgrade and the dense jungle, but after some of the jungle had been blown away by 3-inch Howitzers and 2-pounders, the third tank put the gun out of action. Actually most of the tanks' firing was more or less blind. The infantry platoon commander supporting the tanks would give the order, 'Rake with Besa between (this tree and that).' The attack continued in a series of short bounds with the tanks firing rapidly on both sides of the road at enemy defences, mainly pill-boxes and

foxholes all with strong overhead cover and sited in depth along the track."

(D. Dexter, *Australia in the War of 1939-45. The New Guinea Offensives.*)

The landing of Matilda tanks in New Guinea, at Milne Bay, in August 1943 was a well kept secret in preparation for their use against the Japanese, but it was some time before a suitable opportunity was presented for the Matildas to come forward in support of the infantry in jungle fighting. Only two squadrons of 1st Australian Tank Battalion were landed and moved to the forward areas, and it was by dint of much hard work in "selling" the tank idea that the tanks were eventually used. Indeed, the fact that the tanks

A Matilda (3in How) of 1st Tank Battalion moving with infantry in thick undergrowth during the assault on the Sattelberg Road, November 17, 1943—the first Australian Matilda action. (Photo: Australian War Memorial)



reached New Guinea at all was the result of much preliminary "selling" by Brigadier Macarthur-Onslow, the commander of 4th Australian Armoured Brigade, for the infantry had an innate mistrust of armour, born of experiences in the Middle East, and needed to be convinced that the tanks would not be more trouble than they were worth in the restricted jungle conditions. Eventually, "C" Squadron was given the chance on November 17, 1943 in the assault on the Sattelberg Road in support of the 9th Division on the Huon Peninsula.

The operations proved convincingly that, properly handled, the Matilda was a powerful weapon in jungle fighting. After the opening engagement:

"morale in the squadron was high; . . . and all were happy about the Matildas which had proved to be powerful and successful weapons and undoubtedly saved the infantry many casualties while allowing a steady progress to be maintained, although this had been somewhat impeded by the difficulties of terrain. The performance of the tanks had amazed even their own crews."

(The Royal New South Wales Lancers. 1885-1960).

The successful use of the Matildas on the Huon Peninsula was not, however, the signal for more tanks to be deployed at once. Operations ended for the 1st Australian Tank Battalion in this campaign in February 1944 and the unit returned to the mainland in

May, to be replaced by 2/4th Armoured Regiment in August. The offensives of 1943-44, in which the Australian Army had been the spearhead in the land battle against the Japanese, had strained the resources of the nation, and during the latter part of 1944 most of the army was preparing for the final effort in 1945.

The Japanese had quickly introduced anti-tank measures after the first encounter with the Matildas, and they made increasing use of mines to protect their positions, supplemented by aircraft bombs and explosives fired by remote control. They had no effective anti-tank gun against the Matilda, however, and their 75-mm. gun could cause little more than superficial damage. Even so, it was not uncommon in 1945 to find this weapon sited in the jungle for anti-tank defence. This account of an engagement in May illustrates those battles at close quarters.

"A log across the track caused the point tank to halt and search the neighbouring ground. The gunner Dick Allen was looking at a large lily leaf when it swayed to one side disclosing the muzzle of a 75 mm. 20 yards away. The gun fired immediately, missing the tank. Without more ado, Dick let fly with 2-pounder, disabling the gun and crew of three. . . . Behind the gun position there was approximately a company of Nips, dug in and with heavy bunker positions. 8 Troop played a merry tune on their Besas and 2-pounders and the Nip very wisely 'scrambled'."

(Tank Tracks. The War History of the 2/4th Australian Armoured Regimental Group).

Landing from an American LST (Landing Ship, Tanks) at Tarakan, April 30, 1945 - 2/9th Armoured Regiment. This tank carries considerable extra armour in the form of spare track plates, as well as metal tracking for the anti-magnetic mine screen.

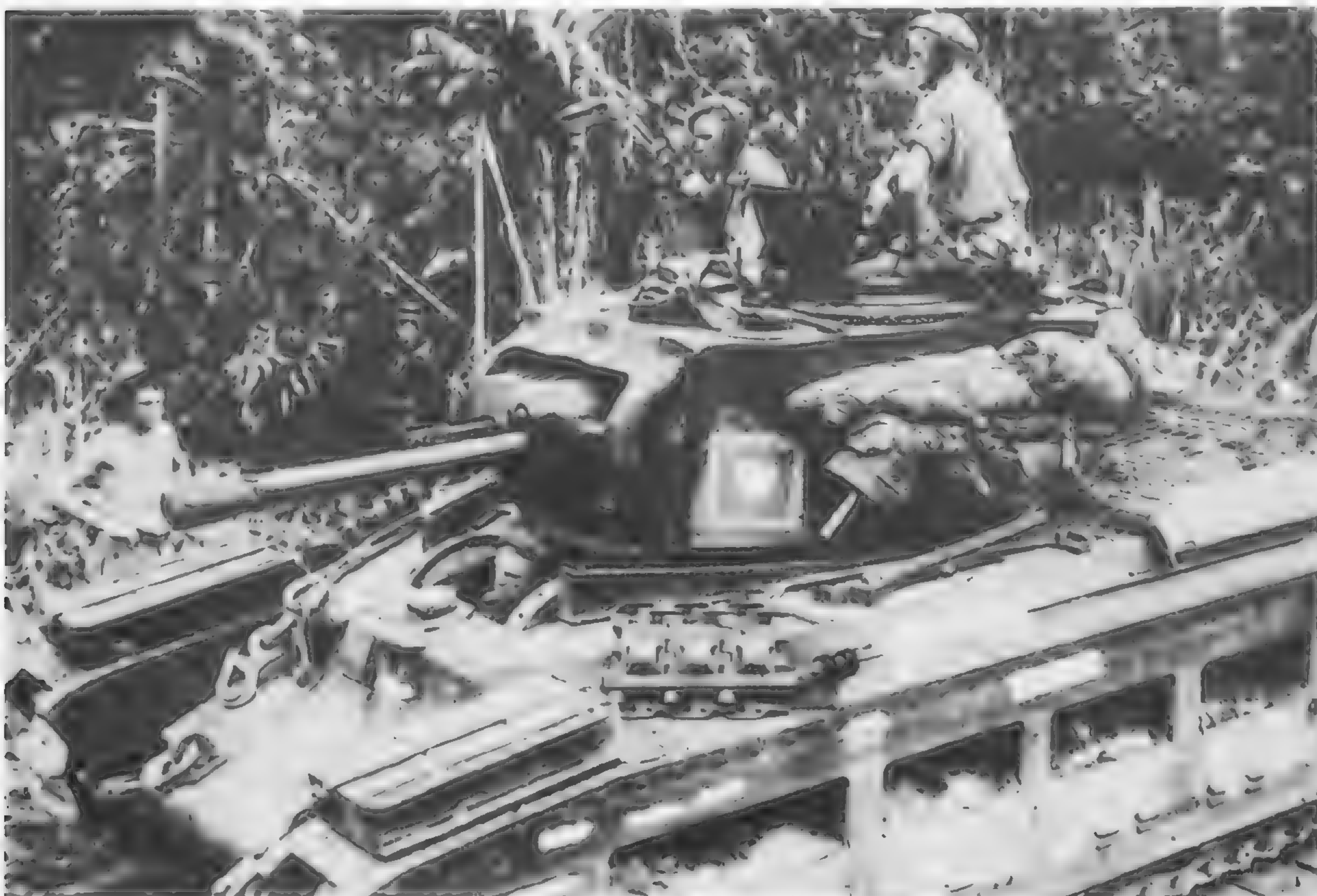
(Photo: Australian War Memorial)





Tanks of 1st Armoured Regiment advancing inland at Balikpapan, July 1945. The wire mesh screen over engine louvers can be seen on the tank, as well as canvas water-proofing (already blown away) hanging from the side. (Photo: Australian War Memorial)

Special bridges had to be built to enable the tanks to move forward. The armoured shield to protect the turret ring, and the anti-magnetic mine screen over the engine louvers are fitted to this tank on Bougainville. (Photo: Australian War Memorial)





Closed down for immediate action, a Matilda of 24th Armoured Regiment moves forward to Slater's Knoll, Bougainville, supported by infantry, April 1945. A spotlight has been mounted beside the driver's hatch. (Photo: Australian War Memorial)



Matilda Frog "flaming".

(Photo: Australian Official)

The Matilda Frog at Puckapunyal, Victoria. Clearly seen here is the armoured shield fitted on the hull top to protect the turret ring, fitted to many Matildas in action at the end of the War.

(Photo: R.A.A.C. A.F.V. Museum)





Knocking down a coconut palm after landing at Balikpapan, July 1945, where the tanks waded through 3 ft. 6 in. surf with ease. On this tank the canvas water-proofing screens over the gun mantlet and sides of the engine compartment have not yet been blown away.

(Photo: Australian War Memorial)

Experience led to modifications on the Matilda and to the development of new equipments. Screens of wire mesh or metal tracking were fitted over engine/air louvres as a protection against magnetic mines, and the turret ring was protected by an armoured shield on the hull top; improvised fittings of microphone and headset were made at the rear as an emergency tank telephone to the crew, until an official modification with a telephone in an armoured box was issued; waterproofing equipment was designed to permit deep wading; a tank dozer, a flamethrowing tank and one which could project a salvo of bombs were developed.

Some of these were ready, in action, during the final stages of the War.

From January 1945 until the end of the War in August the 2/4th Armoured Regiment had three squadrons of Matildas taking part in the campaigns from Aitape to Wewak, and on Bougainville Island. Just as the tanks had shown a year before, they proved their worth again and saved many casualties, converting most of their remaining critics to the need for armour in that type of warfare. Tanks are apt to be cumbersome beasts, however, when facilities for movement are restricted, and throughout the campaigns the

Matilda Frog of 2 1st Armoured Brigade Reconnaissance Squadron moving with infantry towards the oil refineries at Balikpapan.

(Photo: Australian War Memorial)





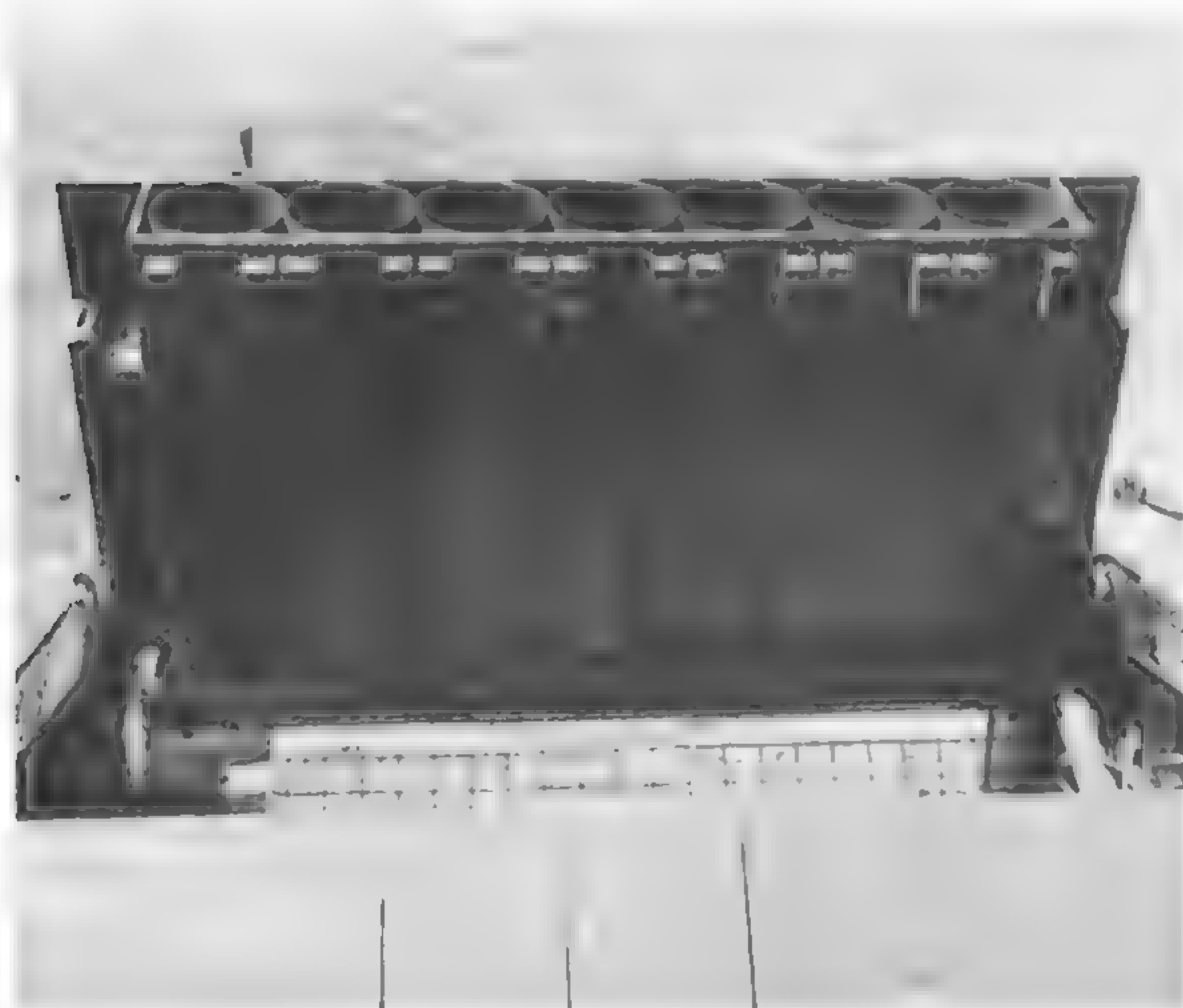
Matilda Frog in action at Balikpapan, July 1945. Ranges of engagement were normally 15–30 yards, with occasional shots up to 90 yards.
(Photo: Australian War Memorial)



Australian Matilda Dozer No. 3. The blade and push poles could be jettisoned without exposing the crew, and the tank could then fight as a normal gun tank.
(Photo: R.A.A.C. A.F.V. Museum)

The Hedgehog projector raised, showing the containers for seven bombs which were fired over the turret. The projector was raised and lowered by a hydraulic ram at each side.

(Photo: R.A.A.C. A.F.V. Museum)



The Hedgehog projector raised in the firing position. When lowered, metal projections through the bottom of the shield held the bombs steady, to protect the fuzes.

(Photo: R.A.A.C. A.F.V. Museum)



tanks were liable to be left behind when the going was difficult, inactive (except for any job to which the Matilda could be put as a heavy, tracked vehicle), waiting for landing craft or struggling to find a way forward through impossible country. Tank crews became adept at rapid waterproofing and improvisations, with their engineer detachments, in dealing with obstacles, through creeks and along jungle tracks, in their determination to get forward.

During the final campaign in Borneo, May—July 1945, the 2/9th Armoured Regiment provided squadrons for the assault landings at Tarakan, at Brunei and at Labuan. The 1st Armoured Regiment, returning under a new name, came into action again in the landings at Balikpapan, where there was fierce fighting for the heavily fortified town and oil refinery.

CIRCUS EQUIPMENT

The specialised equipments which were being developed in Australia, or intended for use in the South-West Pacific operations, acquired their own descriptive title as the "circus equipment", similar to the "Funnies" of the British 79th Armoured Division. They included the flamethrowing Matilda Frog, the Matilda Dozer, the bomb-launching Matilda Hedgehog and the Covenanter Bridgelayers. Work in developing and testing the "circus equipment" was carried out in units of 4th Armoured Brigade equipped with the Matilda, but for operational purposes in Borneo the Matilda equipments were taken over by 2/1st Armoured Brigade Reconnaissance Squadron. Detachments of the squadron accompanied and went into action with the armoured regiments which carried out the assault landings in Borneo in June/July 1945, but other equipments which were sent to New Guinea and Bougainville arrived too late to take part in any fighting.

MATILDA FROG

The Australian Matilda Frog was developed specifically for operations against Japanese bunkers and pillboxes in the South-West Pacific area, and the demand for a tank-mounted flamethrower was initiated soon after the New Guinea operations of December 1942. There were, however, considerable problems affecting research and development, using locally available materials, and it was not until 1945 that the Matilda Frog was ready for action in the closing stages of the War.

Automotively, the tank was identical with the normal Matilda, and superficially it resembled the gun tank in having the flame projector nozzle extended forward of the gun mantlet inside a mild steel tube. In appearance this was like the 3-in. Howitzer barrel, except for the counter-weight at the muzzle.

The 7.92-mm. Besa co-axial machine-gun was retained, but it was awkward to handle because of the other equipment which was introduced in the turret. An 80 gallon fuel tank was fitted inside the turret basket, filling most of the forward and right sections up to the level of the turret ring (a jettison tank at the rear provided another 40 gallons, the fuel being transferred to the main tank by electric pump). A compressed air tank, behind the fuel tank and to the right of the commander, provided pressure for fuel supply to the projector. Traverse of the turret was by



Matilda Hedgehog with the projector, over the rear of the engine compartment, lowered in the travelling position. The Hedgehog bomb, standing at the side, weighed 63 lb.

(Photo: R.A.A.C. A.F.V. Museum)

the normal Matilda hand and powered systems, while elevation and depression of the coaxial Besa/flame projector mounting was obtained by a special sprocket and chain drive from a small handle suspended from the turret roof. A normal optical sight was used.

A maximum range of 145 yards has been quoted for the flamethrower but, when the Matilda Frog went into action, the normal range of engagement was 15-30 yards with occasional shots up to 90 yards.

A troop of Frogs went ashore with 2/9th Armoured Regiment in the landing at Labuan on June 10 and, during the battles that followed, had the distinction of being the first flamethrowing tanks to go into action with the Australian forces. Another troop of Frogs landed with 1st Armoured Regiment at Balikpapan on July 1 and was soon in action to burn out bunkers, tunnels and buildings. The Frogs worked closely with other Matildas in support of the infantry, the basic drill being for gun tanks to engage and blast open the bunker positions from the flanks, while the Frogs advanced frontally to close range.

MATILDA DOZER

The Matilda Dozer was an Australian development for use in clearing away obstacles when under fire and, although the bulldozer kit involved substantial fittings inside and out, the tank remained a gun tank with its normal armament.

The bulldozer blade assembly was attached to push poles riding on trunnions mounted to the skirting

The rear of the Matilda Hedgehog, with rear cover open.

(Photo: R.A.A.C. A.F.V. Museum)





Matilda Dozer in use in New Guinea. This is an early version in which the blade is controlled by winch and cable mounted on the hull front.
(Photo: Australian War Memorial)



Watched by interested spectators, a Matilda 3-in Howitzer fires onto a distant pillbox, directed by telephone from a forward infantry position at Tarakan.
(Photo: Australian War Memorial)

plates on each side. On an early version of the Dozer the blade was raised by cable and winch on the front of the hull, but the Matilda Dozer 3 incorporated two hydraulic jacks in armoured shields mounted on the sides of the tank, each operating through a pivot frame and connecting link to the push pole. Hydraulic power was provided by a gear type oil pump mounted low between the engines and chain-driven from the propeller shaft. The oil reservoir for the system was fitted in the hull within the fighting compartment.

All operations of the blade were controlled by the driver and, in Dozer 3, both the blade and push poles could be jettisoned without exposing the crew.

A troop of Matilda Dozers landed on the first day at Balikpapan but it was found that they were unable to help much in recovery of other tanks which had been bogged—hardly a fair task on which to judge a tank dozer—and the blades were dropped so that the tanks could be used in their rôle as gun tanks.

MATILDA HEDGEHOG

The Hedgehog projector was originally a Naval store designed as an anti-submarine weapon, and this was seen to have a value also in bunker-busting, as a means of delivering a heavy, High Explosive bomb at short range. As a result, and to give the weapon armoured mobility, the Matilda Hedgehog was developed to carry seven Hedgehog bombs, suitably modified, within a double shield of boiler plate over the rear of the engine compartment.

The bombs weighed 63 lbs. each (37 lbs. of Torpex explosive) and they were mounted on spigots on a rotatable shaft which was turned by two hydraulic rams; the rams were operated by a pump connected to an electric motor and control valve. The bombs were fired electrically, either singly or as a salvo, from a switch and plugboard on the hull side behind the gunner. The maximum range was normally 200 yards but, with a new propellant, a range of 330 yards was achieved.

In operation the tank took up position with the turret at 12 o'clock and the commander lined the tank onto the target by means of a sight on the turret top.

The driver operated the hydraulic control valve to raise and lower the projector, and he had two indicators from which he could tell the commander both the angle of elevation of the weapon and any error in the level of the tank sideways (which would mean a correction for line). The projector was set at an angle to suit the range and, after firing the first bomb, corrections of aim were effected either by moving the tank or raising/lowering the projector. Inter-locking safety switches were incorporated in the firing system so that bombs could only be fired between safe minimum and maximum elevations; to protect the wireless aerial, bomb No. 5 could only be fired with the turret at 1 o'clock and, for that position, the commander had another sight on the turret.

The Matilda Hedgehog remained a normal gun tank in other respects and the mounting of this additional armament was an ingenious arrangement. Many of the parts used were acquired from other equipments, the hydraulic rams having been designed for an aircraft under-carriage and the hydraulic control valve being taken from the M3 Medium tank. Though the tank lacked sophisticated methods of control, it incorporated proper safety devices and it was proved to have the accuracy to engage spot targets, with a powerful blast effect. However, it was never to be tried in battle. A troop of six Matilda Hedgehogs was formed in 4th Armoured Brigade and these were sent to Bougainville in 1945, but they arrived too late for action before the end of the War.

POST-WAR MATILDA

When the Citizen Military Force (equivalent to the British Territorial Army) was re-formed in 1948, the Matilda tank was issued for training in some of the armoured units, and in this capacity filled an important need during the next few years. However, age and deterioration made it increasingly difficult to keep the tanks on the road. In 1955 the Matilda was withdrawn from training in the C.M.F. and was generally replaced by the Centurion.

AFV Series Editor: DUNCAN CROW

AFV/Weapons Profiles

Edited by DUNCAN CROW

Starting with AFV/WEAPONS PROFILE 24 the Publishers intend to step up the frequency of publication. This departure, taken in order to meet the great demand for coverage of more AFVs more quickly than in the programme that has been running for the past two years, has necessitated some further re-arrangement in the list of titles.

32 M6 Heavy and M26 (Pershing)

This Profile describes the curious history of the U.S. M6 Heavy Tank and highlights the fierce controversy that raged over "giant" tanks—not only in the United States, it must be added; the M26, named after General Pershing, also started life as a heavy tank, and a few were in action in Germany in 1945. In May 1946 the Pershing's designation was changed from Heavy Tank M26 to Medium Tank M26, and as such it fought in Korea along with the M46 and M47 Mediums (Patton) that were a re-built version of it: BY COLONEL ROBERT J. ICKS, author of *AFV Profile 16* and *AFV/Weapons Profiles 24, 26*, who has a close knowledge of the tanks' development.

33 German Armoured Cars

As light tanks became popular in the 1930s the importance of armoured cars declined . . . except in Germany and France; Germany attached great importance to them and they were the basic vehicles of the Panzer divisions' reconnaissance units in World War II, achieving great success as this Profile shows: BY MAJOR-GENERAL N. W. DUNCAN, whose distinguished military career in armour has included service in armoured cars in the *Royal Tank Corps*, and command of the *30th Armoured Brigade* in *79th Armoured Division*. General Duncan has been Representative Colonel Commandant of the *Royal Tank Regiment*, Governor of the *Royal Hospital Chelsea*, and Curator of the *Royal Armoured Corps Tank Museum*. He is the author of *AFV Profiles 5, 9, 12, 15*.

34 Scorpion

Britain's new aluminium light tank, weighing eight tons, powered by a conventional Jaguar XK 6-cylinder engine of 4,200 c.c., and mounting a 76-mm. gun, is the first all-aluminium armoured vehicle in the world: BY R. M. OGORKIEWICZ, author of *AFV/Weapons Profile 28*, who is the first non-American and only the tenth person in its 85-year history to be made an honorary life member of the *U.S. Army Armor Association*.

35 Wheels, Tracks and Transporters

British Armoured Recovery Vehicles

The problems of getting tanks to the battle and recovering them when they have been disabled are the subject of this Profile, in which MAJOR-GENERAL DUNCAN (author of *AFV Profiles 5, 9, 12, 15*, and *AFV/Weapons Profile 33*) traces the development in Britain of machines—some like "skyscrapers on roller skates"—to overcome the track wear bugbear until the adoption of wheeled transporters proved a better solution, and Peter Chamberlain describes the armoured recovery vehicles used by British and Commonwealth units in World War II.

36 French H35, H39, and S 35

The Hotchkiss and Somua tanks equipped the *brigades de combat* of the French mechanised cavalry's *divisions légères mécaniques*, two of which had been formed before the outbreak of war in 1939, and there was a *demi-brigade* of Hotchkisses in the *divisions cuirassées*; the Hotchkiss was the second most numerous type of French tank, while the Somua was considered by many to be one of the finest AFVs of its day: BY MAJOR JAMES BINGHAM, RTR, who fought in France in 1940 when these tanks were in action.

37 Russian BT

This series of Russian tanks was based on the American Christie design and its final variant was the forerunner of the famous T-34: BY JOHN MILSOM, author of *Russian Tanks 1900—1970* and *AFV/Weapons Profile 22*.

The publishers reserve the right to alter sequence of list without notice.

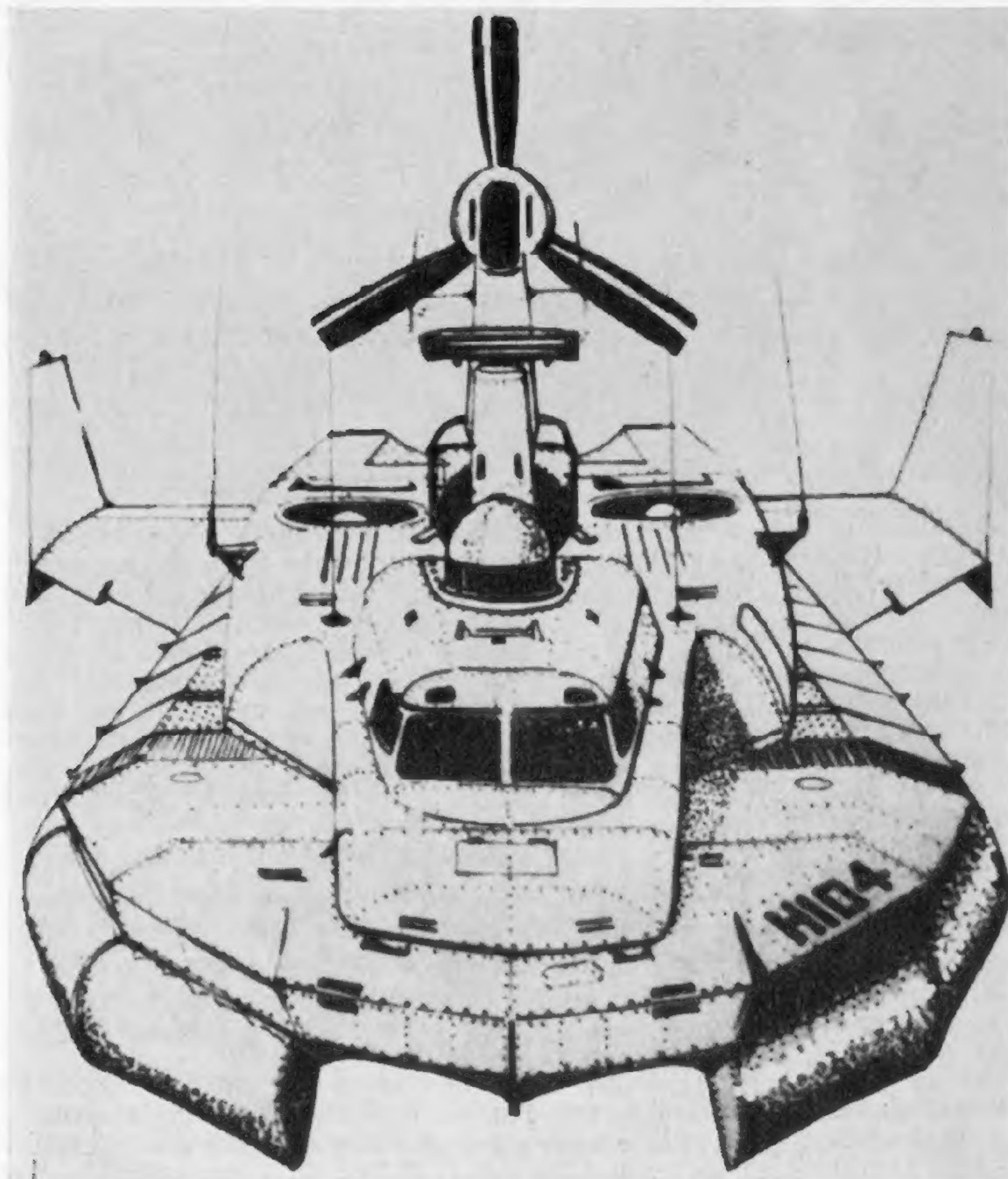
Parts 1–17 price 25p each from your local book or model shop. Part 18 onwards price 35p each.
Retail prices in USA 1–17 \$1.25. 18 onwards \$1.50.

If you have any difficulty in obtaining Profiles from your local book or model shop please write direct to:

Mail Order/Subscription Department,

PROFILE PUBLICATIONS Ltd, Coburg House, Sheet Street, Windsor, Berks. SL4 1EB

See the Bug . . .



Aldershot Army Display

JULY 10th and 11th, 1971

It's a great show worthy of a visit—by all the family

We shall have an exhibition stand in the Recreation Section and would be delighted to see any of our readers who will be attending.

There'll be plenty of AFVs about—and *Profiles* to match.

Don't miss seeing the prototype working model of the Profile Bug Mk. I.

There's plenty of performance data about other AFVs—
not forgetting the other series—Aircraft, Locos and Warships.

We look forward to seeing you—remember July 10th and 11th.

Profile Publications Ltd.

Coburg House, Sheet Street, Windsor, Berks, SL4 1EB